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IS 12508 (1988): Electric Tachometer System for Automotive Vehicles [TED 11: Automotive Electrical Equipment]

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“Knowledge is such a treasure which cannot be stolen”





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*Indian Standard*

# SPECIFICATION FOR ELECTRIC TACHOMETER SYSTEM FOR AUTOMOTIVE VEHICLES

**1. Scope** — Specifies tests and performance requirements of electric tachometer system with or without hour meter or revolution counters for use on automotive vehicles other than the two and three wheelers.

## 2. Definitions

**2.1 Electric Tachometer** — A tachometer in which means of detection, transmission and indication are electrical.

**2.2 Sensing Unit** — A sensing unit supplies signals proportional to the engine speed. There are three types of sensing unit:

- a) Permanent magnetic generator,
- b) Magnetic switch or magnetic sensor, and
- c) Tapping from alternator.

**2.3 Hourmeter** — The hourmeter is a true time indicator of engine run.

**2.4 Indicating Unit** — The pointer or other means by which the measured engine speed is indicated on the scale.

**2.5 Scale** — An array of marks together with any associated figures from which the indicated speed (rpm) may be read.

**2.6 Scale Mark** — One of the marks constituting a scale.

**2.7 Scale Length** — The distance between the centre of terminal scale marks measured along the scale base.

**2.8 Effective Range** — That portion of the scale over which the instrument purports to comply with specified limits of accuracy.

**2.9 Amplitude** — In an oscillatory motion, the departure of the extreme point of the movement of the index from the zero or the rest position.

**2.10 Accuracy** — The degree of closeness with which the indications of an instrument approach the true values of the quantities measured.

**3. Construction** — When analog displays are used, the display shall be accomplished by a pointer or other indicator, transversing in a clockwise or left to right direction to indicate increasing revolutions per minute over a suitable scale on the indicating unit dial.

**3.1 Graduation** shall be designed for the best practical legibility and accuracy of reading.

**3.2** Unless otherwise specified the pointer and dial printing shall be in white. The dial background shall be low-gloss, black. The visible portion of the indicating unit shall exhibit low reflectivity. The time or revolution indicator shall have white numerals on a low gloss black background

**3.3** The indicating unit case shall be provided with mounting stud with suitable 'U' clamps or similar arrangement.

**3.4** The overall dimensions shall be as agreed to between the manufacturers and the purchasers.

## 4. Tachometer and True Hourmeter (Allowable System Variation)

**4.1 Tachometer Driven by Signal from Ignition System or Alternator AC Tap** — The tachometer indication shall be within  $\pm 2$  percent of full scale with nominal voltage, when the tachometer is driven

with a signal from an ignition system or from an alternator AC tap as applicable. If a calibrator is used it shall supply a signal having the same characteristics as that supplied by the ignition system or an alternator AC tap. The calibration of tachometers shall be made with the instrument in approximately the same angular position that it will have when mounted on the vehicle.

**4.2 Sensor Driven Unit** — The tachometer indication shall be within  $\pm 2$  percent of full scale with nominal voltage, when tachometer driven with a signal from a sensor is either rotated or excited simulating an actual operation. If a calibrator is used, it shall supply a signal having the same characteristic as the sensor. The calibration of tachometers shall be made with the instruments in approximately the same angular position that it will have when mounted on the vehicle.

**4.3** The permissible variation in readings of the instrument due to variation in voltage is given in Table 1.

TABLE 1 VOLTAGE VARIATION

Sl No.	Instrument	Voltage	Variation
i)	Indicating unit	12 V system 12-16 V DC 24 V system 24-32 V DC	$\pm 1\%$ of full scale reading from the reading obtained in Table 2
ii)	True hourmeter	12-16 V DC 24-32 V DC	$\pm 3\%$ from the reading obtained in Table 2
iii)	Hourmeter proportional to number of revolutions of the engine	12-16 V DC 24-32 V DC	$\pm 0.3\%$ from reading obtained in Table 2 at 24 $\pm 3^\circ\text{C}$ with nominal input rpm required to indicate 1 hour

**4.4 True Hourmeter** — The hourmeter indication shall be within  $\pm 2$  with nominal voltage.

**4.5 Hourmeter Proportional to Number of Engine Revolution** — The time indication shall be within  $\pm 0.3\%$  with nominal voltage applied, nominal input rpm required to indicate one hour.

**Note 1** — In the event of voltage variable, Table 1 is to be referred for allowable variation.

**Note 2** — The tolerance for hourmeter indications as per 4.4 refer to variations due to voltage; and for time, refer to instrument error when nominal voltage and input speed ( rpm ) has been applied.

**4.6** The system accuracy of tachometer and true hourmeter shall be  $\pm 2$  percent.

## 5. Tests

**5.1 Acceptance Test** — The following acceptance tests are to be done on every instrument produced:

- Visual test,
- Accuracy test,
- Index stability test, and
- Insulation test.

**5.1.1 Visual test** — When visually examined the instrument shall be free from defects.

**5.1.2 Accuracy test** — The tachometer is driven with a signal from ignition system or from an AC alternator tap. A calibrator also shall be made use of provided it supplies a signal having same characteristics as that supplied by an ignition system or an alternator tap. Calibration of tachometer shall be made with the instrument in approximately the same angular position that it will have when mounted on the vehicle. Measurements shall be made between 0 to 100 percent of the range, to establish the overall accuracy specified in Table 2.

**5.1.3 Index stability test** — The tachometer shall be driven by a uniformly steady drive with a signal from an ignition system or from an alternator AC tap. A calibrator also shall be used provided the signals having same characteristics of ignition system or an alternator AC tap. When tested the index of the tachometer shall have a smooth and continuous reading for a gradually increasing and decreasing speed and at any one reading the index oscillation shall be within  $\pm 1$  percent of the full scale indicator for any indicated value.

**5.1.3.1 Sensor driven units** — The tachometer shall be driven with a signal from a sensor either rotated or excited in a fashion simulating actual operation. If a calibrator is used it shall supply a

signal having the same characteristics as the sensor. Calibration of tachometers shall be made with the instrument in approximately the same angular position that will have when mounted in the vehicle. The allowable variation is given in Table 2.

**TABLE 2 ACCURACY OF ENGINE RPM INDICATION**  
(*Clauses 5.1.2, 5.1.3.1 and 5.2.13*)

Sl. No.	Instrument	Voltage	RPM Allowable System Variation
I)	Tachometer driven by signal from ignition system or alternator AC tap	12 V DC	± 2% of full scale
II)	Sensor driven units	do	± 2% of full scale
III)	True hourmeter ( hourmeter indication )	do	within ± 2%
IV)	Time Indication	do	within ± 0.3%

**5.1.4 Insulation test** — The insulation resistance of electrical tachometer shall be measured to  $100 \pm 1\%$  of full scale indicator for any value indicated.

## 5.2 Type Tests

**5.2.1** The following shall constitute the type tests for assessing the tachometer and its sensing unit:

- a) Cold test,
- b) Dry heat test,
- c) Damp heat ( cyclic ) test,
- d) Dust test,
- e) Rapid change of temperature test,
- f) Mould growth test,
- g) Corrosion resistance test,
- h) Contamination test,
- j) Vibration test, and
- k) Endurance test.

**5.2.2** For the purpose of type tests, the tachometers shall be classified as Group 3 equipment ( see IS : 10250-1982 Specification for severities for environmental tests for automotive electrical equipment ).

**5.2.3 Cold test** — The tachometer shall comply with 4.4.2 of IS : 10250-1982 when tested in accordance with IS : 9000 ( Part 2/Sec 1 to 4 )-1977 'Environmental testing procedures for electronic and electric items: Part 2 Cold test'. The duration of exposure shall be two hours at  $-10^{\circ}\text{C}$ .

**5.2.4 Dry heat test** — The tachometer shall comply with 4.2.2 of IS : 10250-1982 when tested in accordance with IS : 9000 ( Part 3/Sec 1 to 5 )-1977 'Dry heat test'. The duration of exposure shall be for four hours at  $70^{\circ}\text{C}$ .

**5.2.5 Damp heat ( cyclic ) tests** — The tachometer when tested in accordance with IS : 9000 ( Part 5/Sec 1 and 2 )-1981 'Damp heat cyclic test' shall comply with 4.3.2 of IS : 10250-1982. The number of cycles shall be seven and the recovery period shall be 24 hours.

**5.2.6 Dust test** — The tachometer shall comply with 4.6 of IS : 10250-1982.

**5.2.7 Rapid change of temperature test** — When the tachometer is tested in accordance with 4.5 of IS : 10250-1982, it shall comply with the following cyclic conditions:

Cold	$-10^{\circ}\text{C}, \text{Min}$
Hot	$+70^{\circ}\text{C}, \text{Max}$
No. of cycles	2
Duration	30 Minutes

**5.2.8 Mould growth test** — The tachometer shall comply with 4.7 of IS : 10250-1982 when tested as per IS : 9000 ( Part 10 )-1982 'Mould growth test'.

**5.2.9 Corrosion resistance test** — The tachometer shall comply with 4.8 when tested in accordance with Appendix A of IS : 10250-1982.

**5.2.10 Contamination test** — When tested in accordance with 4.9.1.2 and 4.9.1.3 of IS : 10250-1982, the tachometer shall show no failure.

**5.2.11 Vibration test** — The tachometer shall comply with 6.2 and 6.3 of IS : 9000 ( Part 8 )-1981 'Basic environmental testing procedure for electronic and electrical items : Part 8 Vibration ( sinusoidal ) test' when tested for vibrational requirements.

**5.2.11.1 Sensor only ( engine mounted )** — The sensor shall be capable of withstanding six hours of vibration without mechanical or electrical failure, two hours in each direction along the three mutually perpendicular axis. One of axis is parallel to the input shaft. The vibration test shall be done at a double amplitude of 0.50 mm with the frequency varying from 10-120-10 Hz at intervals of one minute as indicated below:

Instrument	Duration	Frequency	Amplitude
Tachometer indicating unit	3 h [ 1 h in each direction along the three mutually perpendicular axis ]	10-30-10 Hz	0.75 mm
Sensing unit	6 h [ 2 h in each direction along the three mutually perpendicular axis ]	10-120-10	0.50 mm

**5.2.12 Endurance test** — The tachometer together with the sensing unit shall be capable of functioning satisfactorily within the limits of accuracy specified in Table 2 for a life of 4 000 h at a scale reading of approximately 25 percent to 75 percent of the full scale reading, or at any higher speed mutually agreed between the manufacturer and the purchaser.

**Note** — Before and after each type test the instrument shall be checked for accuracy test.

## 6. Marking

**6.1** Each indicating unit shall be marked with the manufacturer's name, serial number, date of manufacture, trade name/brand name, accuracy range (  $\pm 2\%$  on full scale deflection ) printed preferably on dial.

**6.1.1** The casing shall contain indications for electrical connections, circuit diagram and any other marking as agreed to between the suppliers and the purchasers.

**6.1.2** For sensing units, the marking shall be as agreed to between the suppliers and the purchasers.

**6.2 Standard Marking** — Details available with the Bureau of Indian Standards.

**7. Packing** — Shall be as per best prevalent trade practice. However, care shall be taken to prevent damages while in transit.

**8. Sampling** — Unless otherwise agreed upon the sampling plan shall be in accordance with IS : 2500 ( Part 1 )-1973 'Sampling inspection tables: Part 1 Inspection by attributes and by count of defects ( first revision )'.

## E X P L A N A T O R Y N O T E

This Indian Standard aims at laying down requirements for electric tachometers used generally by automotive vehicles other than two and three wheelers.

Tachometers on auto vehicles facilitate in guiding the driver to maintain specified engine speed while driving in various gears. It is an essential item for proper maintenance of a vehicle.

In the preparation of this standard, assistance has been derived from:

SAE J 1399-1984 Electric tachometer, issued by the Society of Automotive Engineers, USA.

BS 3190 : 1972 'Specification for speedometer and odometer systems for road vehicles, issued by the British Standards Institution.